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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/751,172	12/30/2003	Jae-Won Han	OPP 031047 US	3390

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EXAMINER

NGUYEN, HA T

ART UNIT PAPER NUMBER

2812

DATE MAILED: 06/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/751,172	HAN, JAE-WON	
	Examiner	Art Unit	
	Ha T. Nguyen	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 15 and 16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>04-11-05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to Applicant

1. Applicant's election with traverse of Group 1-14 in Paper filed 5-25-5 is acknowledged. The traversal is on the ground(s) that the amendment to claim 15 overcomes the reason supporting the restriction requirement. This is not found persuasive because the two groups of claims are distinct not only for the given reason but for many more. For example, the method claims are relate to a process of cleaning a substrate having a transistor in a method of forming silicide region while the product claims are related to contact structures on a substrate having isolation regions and transistors having metal silicide. The product can be made without any cleaning or any specificity about the cleaning steps.

The requirement is still deemed proper and is therefore made FINAL.

Claims 15 and 16 are therefore withdrawn from consideration

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103 and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

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3. Claims 1-2, 8-9, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka (USPN 6337272).

Referring to Figs. 1A-2B and corresponding text, Hamanaka discloses [Re claim 1] a method of manufacturing silicide, comprising the steps of : (a) cleaning a semiconductor substrate with a transistor formed thereon, the transistor including a source electrode, a drain electrode and a gate electrode (b) placing the cleaned semiconductor substrate into a sputter chamber in a deposition equipment, and forming silicide at the same time of depositing a metal film under a state where the semiconductor substrate is heated at a temperature of 450C; (c) removing residual metal film not used for the formation of silicide; and (d) annealing the semiconductor substrate; [Re claims 2 and 8] wherein , in the step (b), silicide with a composition ratio of CoSi is formed; [Re claim 14] wherein, the silicide anneal in the step (d) comprises a composition of CoSi₂ (see col. 8, lines 7-60 and col. 9, line 40-col. 10, line 13). But it fails to disclose expressly the claimed temperature range. However, in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists (See MPEP 2144.05).

[Re claim 9] Hamanaka fails to disclose wherein , in the step (b), the metal film is formed by using a cobalt sputter with DC power of 2-10kW. However, the power used depends on the desired rate of deposition, which changes with the requirements of a specific application.

[Re claim 12] Hamanaka also discloses wherein , the step (d) includes heating the semiconductor substrate during a predetermined duration at a temperature of more than 500C in a RTP equipment (see col. 5, lines 40-62).

[Re claim 13] Hamanaka fails to discloses wherein , in the step (d) includes heating the semiconductor substrate during 20-60 minutes at a temperature of 500-900C in an electric furnace. However, the examiner takes Official Notice annealing in a furnace is conventionally done, the duration of the annealing depend on the thickness of the layer to be silicided and the temperature of the annealing.

Therefore, at the time of the invention, it would have been obvious to use Hamanaka's teaching to obtain the invention as specified in claims 1-2, 8-9, and 12-14.

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4. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka, as applied above, in view of O'Brien et al. (USPN 6458711, hereinafter "O'Brien").

Hamanaka discloses substantially the limitations of claims 3-4, as shown above. It also discloses [Re claim 4] wherein the step (a) includes a second cleaning step of cleaning the semiconductor substrate using HF or DHF solution (see col. 8, lines 7-15).

But it fails to disclose expressly [Re claim 3] wherein the step (a) includes a first cleaning step of cleaning the semiconductor substrate using SC1 solution.

However, the missing limitation is well known in the art because O'Brien discloses this feature (See col. 3, lines 40-55).

A person of ordinary skill is motivated to modify Hamanaka with O'Brien to clean undesirable metallic material.

Therefore, at the time of the invention, it would have been obvious to combine Hamanaka with O'Brien to obtain the invention as specified in claims 3-4.

5. Claims 5-7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka, as applied above, in view of Sumi (USPN 6022805).

Hamanaka discloses substantially the limitations of claims 5-7 and 10, as shown above.

But it fails to disclose expressly the details about the dry etching.

However, the missing limitations are well known in the art because Sumi discloses the use of Ar for sputtering etch with flow rates of 20sccm or 2sccm and power of about 500W, the conditions can vary depending on the amount of oxide to be etched, the exposed features, and acceptable duration (See col.10, lines 3-11 and col. 12, lines 40-49).

A person of ordinary skill is motivated to modify Hamanaka with Sumi to obtain a desired surface oxide etch with damaging the critical dimensions of exposed features.

Therefore, at the time of the invention, it would have been obvious to combine Hamanaka with Sumi to obtain the invention as specified in claims 5-7 and 10.

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over, as applied above, in view of Wake (USPN 6725119).

Hamanaka discloses substantially the limitations of claim 11, as shown above.

But it fails to disclose expressly wherein , the step (c) includes a first removal step of removing the metal film during 5-15 minutes in SPM solution at a temperature of 50-150C and a second removal step of removing the metal film during 3-10 minutes in SC1 solution at a temperature of 40-70C.

However, the missing limitations are well known in the art because Wake discloses the etching in SPM and SC1 (APM) (See col. 17, line 57-col. 18, line 38). Wake does not disclose the duration and temperatures. However, it would have been obvious for an ordinary skills to use conventional etchants to etch at a temperature and duration to achieve the cleanness required for a specific process.

A person of ordinary skill is motivated to modify Hamanaka with Wake to use conventional etchants with known characteristics.

Therefore, at the time of the invention was made, it would have been obvious to combine Hamanaka with Wake to obtain the invention as specified in claim 11.

Conclusion

7. The prior art relevant to the disclosure of this application and not being used in the rejections.

USPN 5275963 to Cederbaum et al. for teaching the annealing in a furnace for 30 minutes.

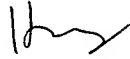
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt, can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ha Nguyen

Primary Examiner

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